Front cover: Historical remarks to the Institute for Chemical Research (ICR)

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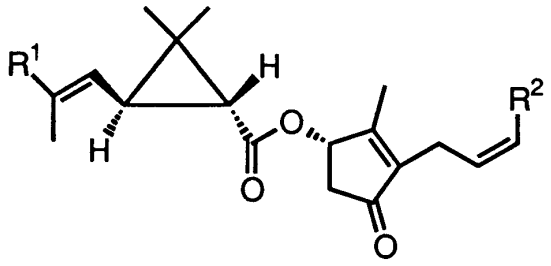
The chemical structure shown on the front cover represents the general formula of pyrethrins.

The insecticidal constituent of pyrethrum flower, *Chrysanthemum cinerariaefolium*, is a mixture of cyclic keto-esters, referred to as "pyrethrins". The insecticidal activity of pyrethrins is so specific in respects of its quick knockdown effect, of the nontoxicity against mammals and of producing no resistance in insects.

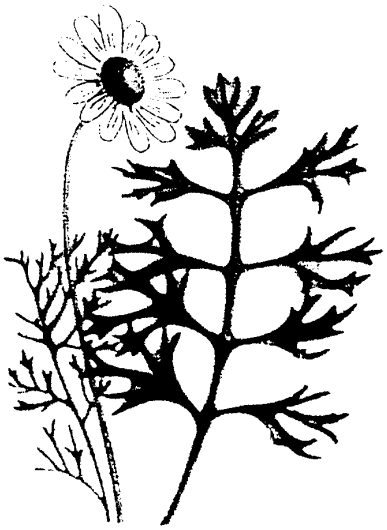
For these reasons, remarkable advances have been made in the field of pyrethrum chemistry during the past half century, and almost all important structural and synthetic problems relating to naturally occurring pyrethrins have successively been dissolved by many workers before 1960. In consequence, it was determined that the natural pyrethrins consist of a mixture of four compounds, pyrethrin-I, pyrethrin-II, cinerin-I and cinerin-II, represented by following structure.



	R^1	R^2
Pyrethrin-I	CH_3	$CH=CH_2$
Pyrethrin-II	$COOCH_3$	$CH=CH_2$
Cinerin-I	CH_3	CH_3
Cinerin-II	$COOCH_3$	CH_3

As can be seen from the structures, these compounds are formed by combination of cyclic keto-alcohol components, cinerolone or pyrethrolone, with the acid components, chrysanthemic acid or pyrethric acid. Among these four components, Yuzo Inouye and his collaborators under the supervision of the late professor Sankichi Takei succeeded in synthesis of pyrethric acid, monomethyl ester of chrysanthemum dicarboxylic acid, free acid itself, and their geometrical isomers. This work enabled the total synthesis of cinerin-II and pyrethrin-II for the first time. In addition, they established the absolute configuration of naturally occurring chrysanthemum diacid and pyrethrolone and cinerolone.

These studies contributed significantly not only to the advance of pyrethrum chemistry, but also to the elucidation between structure and bioactivity, and the development of an effective synthetic derivatives as insecticides.



Pyrethrum Flower